

Remarks/Arguments:

Claims 1, 5-8, 11-20, and 23-34 are presently pending, with claims 17-20 and 27-30 withdrawn from consideration. Claims 1, 5-8, 11-16, 23-26, and 31-34 stand rejected. Claims 1, 5, 8, 11, and 16 have been amended. Claims 2-4, 9, 10, 21, and 35-37 have been cancelled. Reconsideration is respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112

Page 2 of the Office Action sets forth "Claims 3, 5-7, 9 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite." In particular, the Office Action sets forth that claims 3 and 9 are indefinite for including certain language. Applicants herein cancel claims 3 and 9. Accordingly, Applicants respectfully request that this rejection be withdrawn.

Claim Rejections Under 35 U.S.C. §§ 102 & 103

Claims 8 and 11-13

Page 3 of the Office Action sets forth "Claims 8, 11-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Bohn (U.S. 6,188,527)." Applicants respectfully request reconsideration of these rejections for the reasons below.

Applicants' invention, as recited by claim 8, includes features which are neither disclosed nor suggested by the cited art, namely:

...a light-emitting element having a light-emitting area, the light-emitting area having an approximately U-shape including three line segments that form two intersections of line segments...

...a composite lens provided on the light-emitting element...

...wherein the composite lens comprises three cylindrical portions disposed coaxially on respective line segments of the light-emitting area, two spherical portions disposed concentrically on respective intersections of line segments of the light-emitting area, and two spherical portions disposed concentrically on respective ends of the line segments not forming the two intersections.

Basis for this amendment may be found in the original application at paragraphs [0027]-[0031] and FIGS. 4A and 4B. No new matter is added.

Bohn is directed to an LED array formed with an optical adhesive. As illustrated in FIGS. 4A and 4B, Bohn discloses spherical lenses 41 and cylindrical lenses 42 formed on LEDs 13.

The Office Action indicates that FIG. 4A of Bohn discloses the features of claim 8. Applicants respectfully disagree. Bohn fails to disclose, teach, or suggest that LEDs 13 have a U-shape including multiple line segments that form intersections. Bohn also fails to disclose, teach, or suggest a composite lens including multiple cylindrical portions and multiple spherical portions. While the Office Action's annotation of FIG. 4A of Bohn makes reference to line segments and intersections, these features are not disclosed, taught, or suggested within Bohn. Accordingly, Applicants respectfully submit that the Office Action relies on impermissible hindsight bias in attributing to Bohn features which are described solely in Applicants' application.

Further, Applicants respectfully submit that Bohn does not disclose a composite lens as recited in claim 8. Bohn fails to disclose, teach, or suggest cylindrical lens portions formed coaxially on line segments. Bohn also fails to disclose, teach, or suggest spherical lens portions formed concentrically at intersections of the line segments, and at the ends of the line segments that do not form intersections.

Accordingly, Applicants respectfully submit that Bohn fails to disclose, teach, or suggest "a light-emitting element having a light-emitting area, the light-emitting area having an approximately U-shape including three line segments that form two intersections of line segments; and a composite lens provided on the light-emitting element, wherein the composite lens comprises three cylindrical portions disposed coaxially on respective line segments of the light-emitting area, two spherical portions disposed concentrically on respective intersections of line segments of the light-emitting area, and two spherical portions disposed concentrically on respective ends of the line segments not forming the two intersections," as recited in claim 8.

It is because Applicants' claimed invention includes the above features that the following advantages may be achieved. "By using such composite lens formed so as to correspond with the approximately U-shaped light-emitting area, the light ray may be refracted toward a light axis direction, i.e., toward a rod lens array in each portion of the approximately U-shaped light-emitting area. As a result, the directivity of the Lambertian emitted light may be narrowed as shown in FIG. 5." See the application at paragraph [0031].

Accordingly, for the reasons set forth above, claim 8 is allowable over the cited art. Withdrawal of the rejection and allowance of claim 8 is respectfully requested.

Claims 11-13 each depend from claim 8. Accordingly, claims 11-13 are also allowable over the cited art for at least the reasons set forth above with respect to claim 8. Withdrawal of the rejection and allowance of claims 11-13 is respectfully requested.

Claims 1, 5-7, 14, and 15

Page 5 of the Office Action sets forth "Claims 1, 2, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Chiu et al. (U.S. PGPub 2001/0010449; hereinafter 'Chiu')." Page 7 of the Office Action sets forth "Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Chiu...further in view of Abbas (U.S. 4,644,342)." Page 7 of the Office Action also sets forth "Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Tanioka et al. (U.S. 6,002,420; hereinafter 'Tanioka')." Applicants respectfully request reconsideration of these rejections for the reasons below.

Claim 2 has been cancelled, thus obviating the rejection of that claim.

Claim 1, while not identical to claim 8, includes features similar to the allowable features of claim 8 set forth above. Claims 5-7, 14, and 15 each depend from one of claims 1 and 8. Applicants respectfully submit that the additions of Chiu, Abbas, and Tanioka fail to make up for the deficiencies of Bohn with respect to claim 8.

Chiu is directed to a high-efficiency white light emitting diode. As illustrated in FIG. 3, Chiu discloses an LED chip 300 having a transparent substrate 302 formed on its upper light-emitting surface 322. An anti-reflective layer 326 is formed on the surface 328 of the transparent substrate 302. The LED chip 300 and transparent substrate 302 are covered by a fluorescent paste 320. See Chiu at paragraphs [0021]-[0024]; and FIG. 3. Chiu fails to disclose, teach, or suggest a composite lens including cylindrical lens portions formed coaxially on line segments and spherical lens portions formed concentrically at intersections of line segments and at the ends of line segments.

Abbas is directed to an array of light emitting diodes. Abbas teaches using a film of silicon nitride as an anti-reflection coating. See Abbas at column 4, lines 34-38. Abbas fails to

disclose, teach, or suggest a composite lens including cylindrical lens portions formed coaxially on line segments and spherical lens portions formed concentrically at intersections of line segments and at the ends of line segments.

Tanioka is directed to an image recording apparatus. Tanioka fails to disclose any composite lens.

Accordingly, Applicants respectfully submit that Bohn, Chiu, Abbas, and Tanioka, either individually or in combination, fail to disclose, teach, or suggest "a light-emitting element having a light-emitting area, the light-emitting area having an approximately U-shape including three line segments that form two intersections of line segments; and a composite lens provided on the light-emitting element, wherein the composite lens comprises three cylindrical portions disposed coaxially on respective line segments of the light-emitting area, two spherical portions disposed concentrically on respective intersections of line segments of the light-emitting area, and two spherical portions disposed concentrically on respective ends of the line segments not forming the two intersections," as recited in claim 8.

As set forth above, claim 1 includes features similar to the allowable features of claim 8 set forth above. Accordingly claim 1 is allowable over the cited art for at least the reasons set forth above with respect to claim 8. Withdrawal of the rejection and allowance of claim 1 is respectfully requested.

As set forth above, claims 5-7, 14, and 15 each depend from one of claims 1 and 8. Accordingly, claims 5-7, 14, and 15 are also allowable over the cited art for at least the reasons set forth above with respect to claim 8. Withdrawal of the rejection and allowance of claims 5-7, 14, and 15 is respectfully requested.

Claims 16, 23-26, and 31-34

Page 8 of the Office Action sets forth "Claims 16, 24, 26, 31, 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins et al. (U.S. 5,711,890; hereinafter 'Hawkins') in view of Bohn." Page 12 of the Office Action sets forth "Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn...further in view of Mesquida." Page 12 of the Office Action also sets forth "Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn...further in view of Scifres et al. (U.S. 3,954,534; hereinafter 'Scifres')." Page 13 of the Office Action sets forth "Claim 25 is

rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn...further in view of Beauvais et al. (U.S. 6,514,877; hereinafter 'Beauvais')." Page 14 of the Office Action sets forth "Claims 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn...further in view of Tanioka." Page 14 of the Office Action also sets forth "Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins modified by Bohn...further in view of Chiu." Applicants respectfully request reconsideration of these rejections for the reasons below.

Claims 21 and 35 have been cancelled, thus obviating the rejection of those claims.

Applicants' invention, as recited by claim 16, includes features which are neither disclosed nor suggested by the cited art, namely:

- ...(b) preparing a glass substrate...
- ...(c) forming a etching stopper film on the glass substrate...
- ...(d) forming an opening array in the etching stopper film...
- ...(e) forming an array of recesses in the glass substrate under the opening array by wet etching, each recess having an approximately U-shape including three line segments that form two intersections of line segments, each recess comprising three cylindrical concavities disposed coaxially on respective line segments of the recess, two spherical concavities disposed concentrically on respective intersections of line segments of the recess, and two spherical concavities disposed concentrically on respective ends of the line segments not forming the two intersections....

Basis for this amendment may be found in the original application at paragraphs [0055]-[0057] and FIGS. 4A, 4B, and 13. No new matter is added.

As set forth above, Bohn, Chiu, and Tanioka, either individually or in combination, all fail to disclose, teach, or suggest a composite lens including cylindrical lens portions formed coaxially on line segments and spherical lens portions formed concentrically at intersections of line segments and at the ends of line segments. Applicants respectfully submit that the additions of Hawkins, Scifres, and Beauvais fail to make up for the deficiencies of Bohn, Chiu, Abbas, and Tanioka.

Hawkins is directed to a method for forming cylindrical lens arrays. As illustrated in FIGS. 4A-4C, Hawkins discloses forming an etch-stop layer 110 on an inorganic support layer

100. Hawkins further discloses subjecting the support layer 100 to a substantially isotropic etch to provide depressions 120. See Hawkins at column 5, lines 33-63; and FIGS. 4A-4C. Hawkins fails to disclose, teach, or suggest forming depressions 120 that include cylindrical portions formed coaxially on line segments and spherical portions formed concentrically at intersections of line segments and at the ends of line segments.

Scifres is directed to a method of forming a light emitting diode array. As illustrated in FIG. 1, Scifres discloses an array of light emitting diodes 1 disposed on a support substrate 2. Support substrate 2 includes a number of hemispherical depressions. See Scifres at column 2, lines 52-66; and FIG. 1. Scifres fails to disclose, teach, or suggest support substrate 2 including depressions that include cylindrical portions formed coaxially on line segments and spherical portions formed concentrically at intersections of line segments and at the ends of line segments.

Beauvais is directed to a method for fabricating masks for UV lithography. Beauvais fails to disclose any process for forming an array of recesses.

Accordingly, Applicants respectfully submit that Hawkins, Scifres, and Beauvais, either individually or in combination with Bohn, Chiu, Abbas, and Tanioka, fail to disclose, teach, or suggest "forming an array of recesses in the glass substrate under the opening array by wet etching, each recess having an approximately U-shape including three line segments that form two intersections of line segments, each recess comprising three cylindrical concavities disposed coaxially on respective line segments of the recess, two spherical concavities disposed concentrically on respective intersections of line segments of the recess, and two spherical concavities disposed concentrically on respective ends of the line segments not forming the two intersections," as recited in claim 16.

It is because Applicants' claimed includes the above features that the following advantages may be achieved. "Therefore, the recess shape corresponding to the shape of the composite lens shown in FIGS. 4A and 4B is formed." See the application at paragraph [0057]. "By using such composite lens formed so as to correspond with the approximately U-shaped light-emitting area, the light ray may be refracted toward a light axis direction, i.e., toward a rod lens array in each portion of the approximately U-shaped light-emitting area. As a result, the directivity of the Lambertian emitted light may be narrowed as shown in FIG. 5." See the application at paragraph [0031].

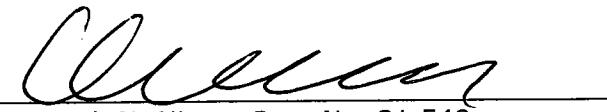
Accordingly, for the reasons set forth above, claim 16 is allowable over the cited art. Withdrawal of the rejection and allowance of claim 16 is respectfully requested.

Claims 23-26 and 31-34 each depend from claim 16. Accordingly, claims 23-26 and 31-34 are also allowable over the cited art for at least the reasons set forth above with respect to claim 16. Withdrawal of the rejection and allowance of claims 23-26 and 31-34 is respectfully requested.

Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Notification of such effect is earnestly solicited.

Respectfully submitted,



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